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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,731	07/25/2001	Tatsuya Kawahara	77661/54	5591
23838	7590	12/20/2004	EXAMINER	
KENYON & KENYON 1500 K STREET, N.W., SUITE 700 WASHINGTON, DC 20005			CREPEAU, JONATHAN	
			ART UNIT	PAPER NUMBER

1746

DATE MAILED: 12/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/911,731

Applicant(s)

KAWAHARA ET AL.

Examiner

Jonathan S. Crepeau

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6-14 and 17-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-3, 6-14 and 17-19 is/are allowed.
- 6) ☒ Claim(s) 20-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 1-3, 6-14, and 17-27. Claims 1-3, 6-14 and 17-19 are allowable. Claims 20-27 are newly rejected under 35 USC §103. As this rejection was not necessitated by amendment, this action is non-final.

Claim Rejections - 35 USC § 103

2. Claims 20-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson et al (U.S. Pre-Grant Publication No. 2003/0082432) in view of Cavalca et al (U.S. Pre-Grant Publication No. 2001/0033960) in view of Johnson et al (U.S. Patent 5,840,438).

Wilkinson teaches a polymer electrolyte fuel cell in paragraphs 4 and 36. The fuel cell includes an electrode (40) comprising a catalyst layer (45) and a substrate (diffusion layer) (42) (see Figure 1). Regarding claims 20, 21, 24, and 25, the porosity (pore amount) and pore size of the substrate increase as the substrate is traversed in-plane in a downstream flow direction (see claims 9 and 10 of the reference). Regarding claims 22 and 26, the substrate may comprise a water repellent layer which may increase or decrease in hydrophobicity as the substrate is traversed in the flow direction (see paragraph 25). The water repellent layer may comprise particulate carbon and PTFE and may change compositionally as the substrate is traversed in the flow direction (see paragraph 25). Regarding claims 23 and 27, the upstream structure of the diffusion layer would inherently function to prevent drying of the cell, and the downstream

structure of the diffusion layer would inherently function to prevent flooding of the cell.

Additionally, the reference teaches that the substrate may comprise a coating having an ionically conductive polymer therein, the composition of the coating changing in-plane (see par. 25).

Wilkinson does not expressly teach that the catalyst layer *per se* comprises a polymer electrolyte resin as one of the components of the layer, the resin being present in a larger proportion at an upstream portion of the catalyst layer, as recited in claims 23 and 27.

Cavalca et al. is directed to a membrane electrode assembly. In paragraphs 124 and 141, the reference teaches that the electrode comprises ionically conductive polymer having the same composition as the polymer electrolyte in a position directly adjacent the electrolyte membrane (i.e., in the catalyst layer).

As such, the artisan would be motivated by Cavalca to include an ionically conductive polymer in the catalyst layer of Wilkinson. First, as noted above, Wilkinson contemplates ionomer components in variable-component coatings on the electrode substrates. Further, in paragraph 124, Cavalca teaches that such inclusion of ionomer in his electrode “improve[s] the contact of the electrode to the membrane and increase[s] catalyst utilization.” As such, the artisan would be motivated to include an ionically conductive polymer in the catalyst layer of Wilkinson, directly adjacent the membrane. Further, there would also be sufficient motivation to vary the amount of ionomer in the catalyst layer, as suggested by Wilkinson in paragraph 25. Accordingly, this limitation would be rendered obvious to the skilled artisan.

However, Wilkinson also does not expressly teach that the thickness of the diffusion layer is smaller at the downstream portion (i.e., greater at the upstream portion), as recited in claims 23 and 27.

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The Johnson et al. patent is directed to a fuel cell also having nonuniform electrode structures. In Figures 9 and 10, the reference teaches a diffusion substrate (116, 126) having a water impermeable or semi-permeable layer (118, 128) thereon, wherein the layer is present only at the upstream portion of the electrode, thereby resulting in a total diffusion layer thickness that is greatest at the upstream portion of the diffusion layer.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to modify the thickness of the water repellent layer of Wilkinson in a flow direction so as to result in a total diffusion layer thickness that is greatest at the upstream portion of the diffusion layer. At column 8, line 51, Johnson teaches the following:

In addition to the embodiments of FIGS. 3-8 that are specifically directed to enhance product water removal, the electrode substrate structure can be modified to control the retention of product water. Such a modified electrode substrate structure to enhance product water retention would be employed in the portions of the electrode that run too dry or to permit operation of the fuel cell with drier reactant inlet conditions (less humidification). Water retention is generally

As such, the artisan would be motivated to use the layers 118, 128 shown in Figures 9 and 10 of Johnson et al. in the fuel cell of Wilkinson, in hopes of enhancing product water retention in the electrodes of Wilkinson.

Allowable Subject Matter

3. Claims 1-3 and 6-14, and 17-19 are allowed.
4. The following is a statement of reasons for the indication of allowable subject matter:

The reasons for allowance with regard to these claims were set forth in the previous Office action and remain applicable herein.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr, can be reached at (571) 272-1414. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jonathan Crepeau
Patent Examiner
Art Unit 1746
December 15, 2004